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GOLD IN KANSAS.

By J. T. LOVEWELL, Topeka, Kan.

Read before the Academy, at Topeka, January 1, 1903.

LAST year, at Iola, I had the honor to read before this Academy some thoughts and records of investigations on the subject "Gold in Kansas Shales." To-day I come before you with a more general proposition, "Gold in Kansas." In the discussion of last year's paper, it was urged that the Kansas Academy of Science could not afford to accept the conclusion that gold existed in the shale-beds along the Smoky river, but, as a concession, a committee was appointed to pursue the investigation. This committee has failed to report, and the present paper will only give some of the facts that have come to my observation during the past year. Many fire and other assays of the shale have been made in my laboratory during this period, but nothing from them specially important can be added to the record already given. The shale from one locality at least, "Section 15," seldom fails to give values in gold. These are generally small, but we find some returns as high as ten dollars, and the average is about \$2.50 per ton.

In last year's paper I was permitted to quote from Doctor Fahrig's report of his first series of experiments on Kansas shales. Encouraged by that report, means were provided for repeating these experiments on a larger scale. A test mill was erected here in Topeka, and a committee sent to ship from the shale-beds to Topeka a car-load of shale. From this material, Doctor Fahrig made, last April, fourteen mill-runs of about 1000 pounds each, and in due time submitted the results in an exhibit which I am happy to be able to place before you. It shows the gold and silver actually obtained from each run, and gives their values and the value per ton of the shale as thus shown.

The table printed at top of next page shows these facts so concisely that I cannot do better than to reproduce it.

Doctor Fahrig has been engaged to resume this work on a much larger scale and with more publicity. Last year it was deemed best to keep the mill closely guarded from public inspection, and no one was allowed on the premises except Doctor Fahrig with two assistants, and a small committee to supervise the work. In the coming series of experiments, the work at the mill can be seen by any one who has a legitimate interest in it, and the shale tested will be from several localities, since it is not settled yet whether the values lie in streaks or are uniformly distributed. The experiments will go far to settle

Kansas shale from Trego county, Kansas. Assays of fourteen mill-runs, by
Dr. Ernest Fahrig, August 12, 1902.

No.	Date.	Class of ore.	Actual weight, lbs.	Weight of gold.	Value of gold.	Weight of silver.	Value of silver.	Value per ton.	Actual value.	Exhibits.	
										Gold.	Silver.
1	April 11	From bin...	1,000	4	\$0 16	112	\$0 14	\$0 60	\$0 30	I	A
2	" 14	" " " "	1,000	15.7	62.8	617	77	2 80	1 40	II	B
3	" 15	" " " "	100	6	24	80	10	6 75	34	III	C
4	" 16	" " " "	1,000	25	1 00.4	320	39	2 80	1 40	IV	D
5	" 17	" " " "	1,000	19	76	552	69	2 90	1 45	V	E
6	" 18	" " " "	1,400	17	68	288	36	5 20	1 04	VI	F
7	" 19	" " " "	1,000	18	72	464	58	2 60	1 30	VII	G
8	" 21	" " " "	1,000	14	56	432	54	2 20	1 10	VIII	H
9	" 22	" " " "	1,000	15.3	61.2	410	51.3	2 25	1 13	IX	I
10	" 24	Committee,	1,000	23	92	424	53	2 90	1 45	X	K
11	" 25	Special.....	1,300	7	36	336	42	1 20	78	XI	L
12	" 26	"	1,200	12	48	288	36	1 40	84	XII	M
E	" 29	Select from bin,	2,000	21	84	208	1 10	1 10	E	N
14	May 2	From bin...	2,000	26	1 04	344	1 47	1 47	XIV	O

All the shale contains more or less zinc and asphaltum petroleum.

the question of cost of extraction, and this of course is the crucial point of the whole investigation.

Doctor Fahrig's process is electrical and its principles are well known to metallurgists, though he has devised appliances which exhibit uncommon mechanical skill in handling the ore.

For an electrolytic fluid Doctor Fahrig makes use of a substance discovered by himself, and named bauxogen. He has found this substance possessed of very unusual and useful properties, aside from its utility as an electrolyte. The exact constitution and mode of manufacture of bauxogen is his secret, and he is confident that if made on a large scale its cost will not be prohibitive. Since a compound such as this cannot be protected by patent, his only chance to profit by his discovery seems to be to keep the mode of making bauxogen to himself.

Among the shale experimenters during the past year, I may mention Waldemar Lingren, sent out from the government chemical department, at Washington. He visited the Smoky valley last June, and took back to Washington specimens of shale from several localities. His report indicated that the shale was subjected, at Washington, to the usual fire tests, and with the usual results, viz.: Many blanks, some small values of gold, and a few that were encouraging. Lingren discovered no trace of zinc, and concludes that, while the shales may contain some gold, the amount does not justify the expectation that it will be found in paying quantities. A report from a government expert doubtless carries much weight, though I am not aware that Lingren employed any methods or used any skill that may not be reproduced by many less known chemists.

Fire assays, at best, are but crude processes, and are liable to many errors. One common source of inaccuracy is the presence of sub-

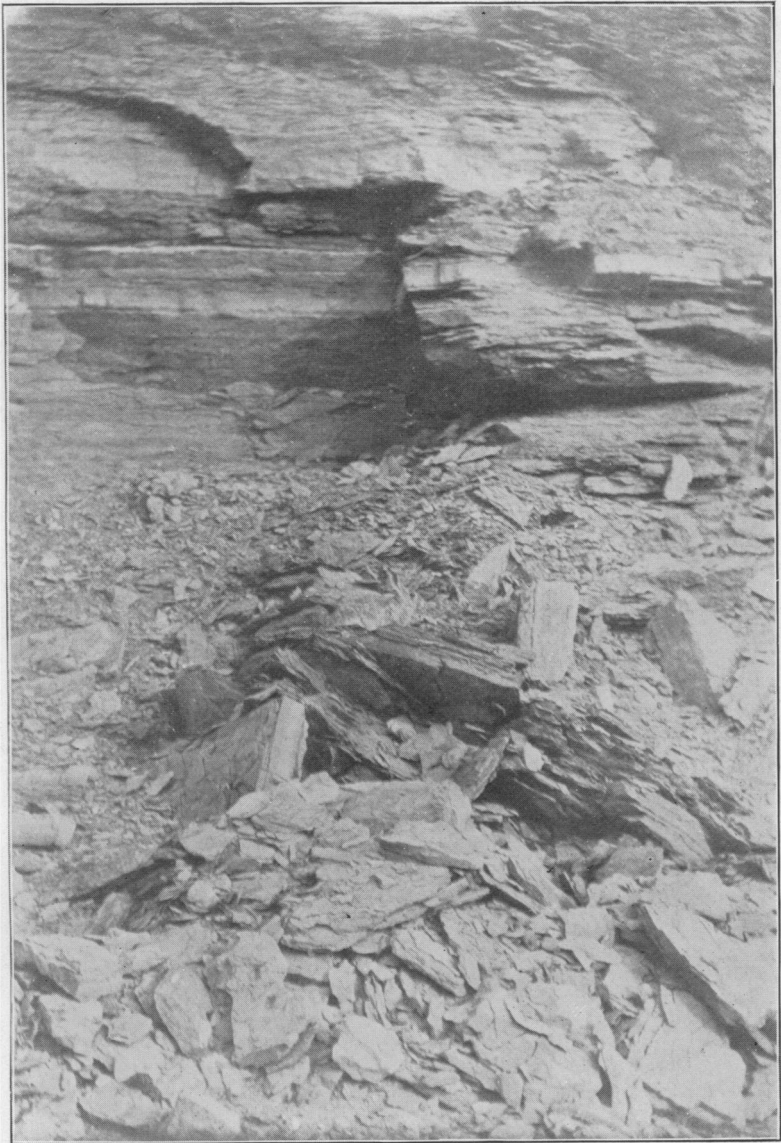
stances which volatilize in heavy vapors that may carry off, mechanically, fine particles of metals whose recovery is sought. As an illustration of this, I have here an ore from a mine in Arizona which carries a large body like this specimen. It shows readily to the eye crystals of the sulphides of zinc and lead. The larger of these constituents is the blende, which prevents wholly the recovery of lead in a fire assay, although by the wet method ten per cent. or more of lead is found. Likewise, the fire assay of this ore fails to show more than one dollar per ton of gold. By pulverizing and washing, however, the galena may be largely separated from the blende, and now, by the fire assay, the residual galena will show eighty dollars per ton of gold, or about ten dollars of gold per ton on the whole mass of ore.

Now, this shale contains some five to ten per cent. of hydrocarbons of the asphalt-petroleum order. It also always contains a quantity of zinc, which varies much in different specimens.

I attribute to these volatile constituents of the shale much of the discordance in our results, although the gold may also be very irregularly distributed.

During the past year I have had occasion to test other specimens of Kansas minerals for gold and silver. My results tend to confirm the belief that gold is one of the most universally distributed of all the metals. I have examined shales from quite a number of localities and found a little gold in a good many instances, but not generally so much from other places as from that which is found along the Smoky river. I have found some gold in the sand from several places in western Kansas, and in pyritic rocks, wherever they occur, gold is likely to be a constituent. This "fool's gold" still leads many people to think they have discovered a gold mine. The assays from these rocks vary from blanks to as much as fifty dollars per ton, but in none of these cases have I yet found evidence of such ore in quantity giving it a commercial value. The rocks from the bluffs up the river from the Rock Island depot have some gold, and in selected specimens from what may be called pockets in these rocks I have found good values. Many of the glacial rocks in this vicinity have been found to contain gold, and some have thought it possible that some time extensive gold deposits may be found along these old glacial moraines.

One of the latest of gold deposits to which my attention has been called is situated two and one-half miles north of Wamego. This locality is one of those which has lately been considered a promising place to explore for oil, gas, or coal. I was asked to inspect a shaft which has been sunk twenty-five feet deep within about fifty feet of Rock creek, a little stream along whose bed are the outcroppings of a



Shale Bank near the Smoky Hill River.

peculiar mineral formation, which probably led to the sinking of the shaft. The shaft goes through a yellow, clayey loam for about ten feet, and then comes a dark colored, hard, finely laminated layer about twelve feet thick. This is interspersed with nodules and crystallizations of marcasite, from the size of shot to a pound or two in weight. The whole layer seems to be largely of the same mineral, oxidized and broken down in its crystallization. This deposit has been submitted to assay by many metallurgists, and found to contain gold and silver. The amount is encouraging to the belief that, with a sufficient amount of the material, we have here, at least, a deposit, where smelting furnaces will soon be producing Kansas gold in paying quantities. The realization of this possibility depends on the extent of the deposit, or how broad is this blanket of which the twelve feet in the shaft is a small section. Below the twelve-foot hard layer we come to a soft gray shale, filled with fossils of the coal formation. The marcasite nodules make from two to ten per cent. of the whole mass of the twelve-foot layer, and they carry more value than the rest in proportion to weight. Investigations are in progress—first, to determine as nearly as possible the proportions of nodules and stratified matter and their respective average values; and second, what is the area of the twelve-foot stratum.

The chief interest in this section at present is the quest for oil, gas, and coal, and borings will soon be made within forty rods of this shaft. There are many things to favor the idea that abundance of oil and gas will be found in northeastern Kansas. The water in bottom of the shaft shows traces of oil and a little farther north, in Westmoreland considerable crude petroleum has been collected from the surface of water in pits of no great depth. At a mill-pond in Louisville, one-half mile from the shaft above mentioned, an inflammable gas rises through the water and large bubbles of it collect under the ice in winter. The boys cut holes in the ice and light the gas with a match. In the development of the mineral resources of our state much depends on abundance of fuel. With the discovery of such gas-wells as those of Iola, their locality will become likewise the seat of cement works and smelting furnaces.

There are great possibilities in the mineral deposits of the earth, and there is sufficient *terra incognita* to satisfy the ambition of explorers and the cupidity of seekers after wealth. There are risks in this search for mineral wealth. There will be many failures and few successes, but when the latter come the former are little considered.

The search for Kansas gold ought not to be discouraged, for it exists in various deposits, and, even if never found plenty enough to pay for extraction, the search is sure to reveal some form of mineral wealth worth all its cost.